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Medical Problems in Chemical Warfare: With the possible exception of the nerve gases, it seems unlikely that chemical agents offer a potential enemy effective weapons for long range attack. The problems of civil defense against chemical attack, therefore, can be reduced to consideration of a single group of chemical agents, the nerve gases, until such time as an enemy may be able to establish a base at or within our borders.

The nerve gases are a family of chemicals having the common property of irreversibly inhibiting the enzyme cholinesterase. They are nearly colorless, essentially odorless liquids, which yield toxic vapors on evaporation. More toxic than formerly known chemical warfare agents, they gain entrance to the body by inhalation of the vapor or by absorption of the liquid agent through the skin, the eyes, or the gastrointestinal tract.

The symptoms induced are due largely or entirely to the inactivation of cholinesterase. This leads to the accumulation of acetylcholine in both the central and the peripheral nervous system and to acetylcholine poisoning. Most of the classic symptoms of both muscarine and nicotine poisoning develop. In severe cases the excessive accumulation of acetylcholine at the myoneural junctions causes a curare-like flaccid paralysis.

Man and experimental animals exhibit a rapid progression of essentially identical symptoms. Exposure to traces of the vapor causes pinpoint constriction of the pupils in a few minutes, usually accompanied with mild paroxysmal bronchoconstriction and a watery nasal discharge. A slightly greater exposure induces ciliary spasm, pain on focusing the eyes, and a drawing sensation or pain in back of the globes radiating frontally or to the occiput, and is often accompanied with moderate photophobia.

At these low doses the paroxysmal bronchospasm does not produce anoxia, lasts only a few days, and is readily relieved by small doses of atropine sulfate. The miosis, ciliary spasm, and headache are more persistent and do not yield to the usual parenteral doses of atropine. The ophthalmic administration of homatropine hydrobromide is required for relief of mild cases, or repeated instillations of atropine, for the severer cases, until good mydriasis is obtained. The headache and eye pain are usually relieved promptly with the induction of mydriasis. The ophthalmic instillations may have to be repeated several times, as miosis and ciliary spasm frequently recur.

The inhalation of larger doses of vapor, or the absorption of liquid nerve gas by other routes, causes a rapid and severe bronchospasm, which obstructs both inhalation and exhalation. The subject becomes confused and cyanotic, may have nausea and vomiting, and soon falls unconscious. Meanwhile, his blood pressure falls to shock level; severe bradycardia develops, and cardiac arrest may occur as a temporary or terminal event.

If the subject can be given medical assistance before the anoxia is too profound and prolonged, large intravenous or intramuscular doses of atropine may completely reverse the cardiorespiratory condition. The bronchial tree relaxes; ventilation of the lungs becomes normal; anoxemia is rapidly overcome; the slowed heart regains its rhythm and normal rate; and the blood pressure rises above normal and quickly drops again to normal level.

Relatively large doses of atropine are required for the severe cases, and the principal danger lies in under-treatment. It is essential that the atropine be given by a route by which it reaches the circulation rapidly. Intravenous administration is preferable, from the standpoint both of rapidity of action and of ease of control of dosage. The intramuscular route may be used if the patient is not cold or in shock. Absorption from the subcutaneous and oral routes is too slow for the initial treatment.

Doses of 2 mg. (1/30 grain) of atropine sulfate should be repeated every few minutes until the cardiorespiratory symptoms are relieved and some dryness of the mouth appears. The amount of atropine some patients can take without the development of atropinization is amazing. Thereafter, smaller oral or parenteral doses of atropine must be administered every few hours for at least several days, since the poisoning is far more persistent than the duration of atropine effects.

Some of these patients will show nicotinic and central nervous system effects, which persist or appear after the muscarinic effects have been controlled with atropine. These effects range from muscular fasciculations and spasmodic twitchings possibly to grand mal seizures of clonic and tonic convulsions. The convulsions may be controlled, to the point that they do not threaten life, with thiopental sodium, trimethadione, or ether anesthesia. Overdosage of thiopental (or any barbiturate) must be avoided, as it acts synergistically with the nerve gases in depressing respiration. A 20 percent solution of trimethadione, given intravenously in 1 Gm. doses every 15 minutes, with a maximum dose of 5 Gm. has the advantage of depressing cortical activity effectively without depressing respiration.

If the severely affected patient cannot be treated promptly, profuse salivation, intestinal hypermotility and spasm, and incontinence of urine and feces will develop. The profound anoxia and increasing accumulation of acetylcholine in the nervous system lead to intermittent then almost continuous grand mal convulsions, until flaccid paralysis supervenes.

The use of atropine is dangerous in severe cases with profound and prolonged anoxia. The administration of atropine in these cases should be delayed until the lungs have been ventilated and the heart has made some recovery from anoxia. The convulsive seizures can be controlled, or largely prevented from reappearing, by intravenously administered trimethadione or thiopental sodium, but the urgent problem in these cases is the paralysis of respiration.

At this late stage a very considerable relaxation of the bronchial tree occurs spontaneously, but respiratory paralysis prevents effective respiration. The paralysis is both central, due to anoxia, and peripheral, due to muscle fatigue and the curare-like blocking of the myoneural junctions of the diaphragm and accessory muscles of respiration by excessive amounts of acetylcholine. The chest is flaccid and collapsed. The usual methods of artificial respiration, such as the Schaefer prone pressure method or the Eve tilt table method are ineffective or impractical. A new method suggested by Emerson may be worth a trial in emergency, but there has not yet been sufficient work to assess its effectiveness properly. This method consists in placing the patient in a prone position, grasping thighs at the level of the pubis and alternately lifting and lowering his hips 10 to 12 inches. Preliminary trials are said to indicate that this method may effectively ventilate the lungs in cases of flaccid paralysis of the respiratory muscles.

The use of an efficient mechanical resuscitator is probably the most practical and reliable method of giving artificial respiration in these cases, provided that the device can be got to the patient, or the patient to it, before irreversible anoxic damage occurs. A light, portable, hand-powered, bellows-type resuscitator may be the most practical for emergency rescue work. Animal experiments indicate that 45 minutes of artificial respiration may be required to restore natural breathing after two or three lethal doses of nerve gas.

If the skin should be splashed with liquid nerve gas, it is important to remove the contamination as soon as possible. The safest and most effective method is to swab the skin immediately with an alkaline fluid. Ammonia water, a 5 to 10 percent solution of sodium carbonate, or a 1 to 2 percent solution of sodium hydroxide is suitable for this purpose. If none of these is available immediately, any available absorbent material may be dampened with water and the area swabbed with this. Swabbing or rubbing the contaminated skin with dry materials must be avoided, as this greatly increases absorption and toxicity. If only dry absorbent material is available, the excess liquid may be gently blotted from the skin, provided wiping and rubbing are carefully avoided, but the contaminated area must be washed with soap and water or swabbed with an alkaline fluid as soon thereafter as possible.

Clothing which is splashed with liquid nerve gas should be removed promptly and left outdoors. Patients should not be admitted to hospitals or other enclosed spaces until all liquid nerve gas contamination of skin and clothing has been eliminated, because the vapors from such contamination will endanger other patients and hospital personnel. This information may be useful in dealing with poisoning by some of the newer insecticides, notably parathion and tetraethyl pyrophosphate (TEPP), which are also powerful though less dangerous anticholinesterases. (J.A.M.A., 21 October '50, Col. J. R. Wood, MC, USA)

The nerve gases under discussion are organic phosphate compounds, whose pharmacologic and toxic effects arise from their ability to inhibit the cholinesterase enzyme present in all animal tissues. Two compounds in this group are useful therapeutic agents: DFP (di-isopropyl fluorophosphate) in abdominal distention, urinary retention, and glaucoma; and TEPP (tetraethyl pyrophosphate) in myasthenia gravis. The toxic effects of these organic phosphate compounds has led to the use of some of them as agricultural insecticides. (J.A.M.A., 21 October '50, D. Grob) (See News Letter of 14 July 1950, Vol. 16, No. 1, p. 30)

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Artificial Respiration. A Comparative Study of Different Methods in Adults Including a New Method; While studies on the efficacy of the various methods of artificial respiration abound, a comparative study of the number of current methods by the same observers, using a significant number of non-rigid human corpses, is not available. The authors used 4 types of subjects in their study of the efficiency of various methods of artificial respiration. The methods are usually classified as manual or mechanical.

The manual methods are:

Silvester Method. The patient is placed in the supine position with the arms at the sides and forearms and hands on the lower thorax. The arms are raised and straightened and extended over the subject's head to effect active inspiration and then returned to their original position, making pressure on the thorax to produce active expiration. The method has the disadvantage of frequent occlusion of the airway by the tongue falling backward into the pharynx. Ribs have been fractured by the exertion of too much pressure.

Schaefer: Prone Pressure Method. The patient is placed in the prone position with arms extended and face to one side. Pressure is exerted with the hands close together on the lower portion of the thorax. The pressure on the thorax causes active expiration, and inspiration occurs passively as the result of elastic recoil. The maneuver requires little muscular exertion by the operator. This is the most widely used method because of its simplicity.

Holger-Nielsen. The patient is placed in the prone position with his hands under his forehead. Several slaps are administered between the shoulder blades to force the tongue out of the pharynx. The elbows are grasped and raised to cause active inspiration; they are then released and pressure is exerted over both scapulae to produce active expiration. Undue pressure may fracture the ribs.

Schaefer-Nielsen-Drinker: Modification of Nielsen Method. The patient is placed in the Nielsen position. One operator performs the prone pressure procedure of the Schaefer method while another operator alternately raises the

elbows or arms. Drinker thus eliminates the pressure exerted over the scapular area in the Nielsen method, which he believes may cause fractures of the ribs. At the same time it retains the well-known features of the Schaefer method.

Emerson. Mr. John H. Emerson has proposed that the hips be lifted and lowered with the patient in the position of the prone pressure method. The raising of the hips several inches causes active inspiration due to descent of the inert diaphragm; lowering of the hips, passive expiration.

Schaefer-Emerson-Ivy: The Prone Hip-Chest Method. With the patient prone, this method alternates the lifting and lowering of the hips as in the Emerson method with pressure exerted on the lower thorax, as in the Schaefer method. To avoid early muscular exhaustion from raising the hips of a heavy person, a piece of cloth, a shirt, or a belt may be passed beneath the hips and the lifting conducted by one or two persons while another carries on the prone pressure maneuver.

The Prone Roll-Chest Method. A modification of the "hip-lifting" technic has been suggested. In order to reduce the fatigue incident to lifting the hips, it appears that elevation of only one hip would produce active inspiration with less effort. In effect, the victim is grasped at the distant hip and "rolled" onto the rescuer's knee. This can be accomplished alone or in conjunction with Schaefer prone pressure.

The mechanical methods are:

Eve: The Rocking Method. The patient is placed in the prone position and is rocked in a head-down and then feet-down position. Unlike the manual methods, the rocking method depends solely on the up and down motion of the diaphragm produced by the movements of the abdominal viscera during rocking.

Automatic Intermittent Positive Pressure. This method expands the chest by intermittently introducing air or a gas mixture under pressure (up to 20 cm. H₂O or 14.7 mm. Hg. in this work) into the upper respiratory passage via a face mask. A Burns valve was used for this purpose by the authors, though there are other good positive pressure devices.

Alternating Negative (-9 mm. Hg.) and Positive (+14 mm. Hg.) Pressure ("Suck and Blow"). Several of these devices were used which provided a positive pressure of +14 mm. Hg. and a negative pressure of approximately -9 mm. Hg. via a face mask.

Chart I shows the inspiratory and expiratory phases of normal respiration, Eve rocking method, and manual methods of artificial respiration with pneumographs produced by each. Chart II shows the advantages and disadvantages of manual methods and Eve rocking method. The results obtained from the

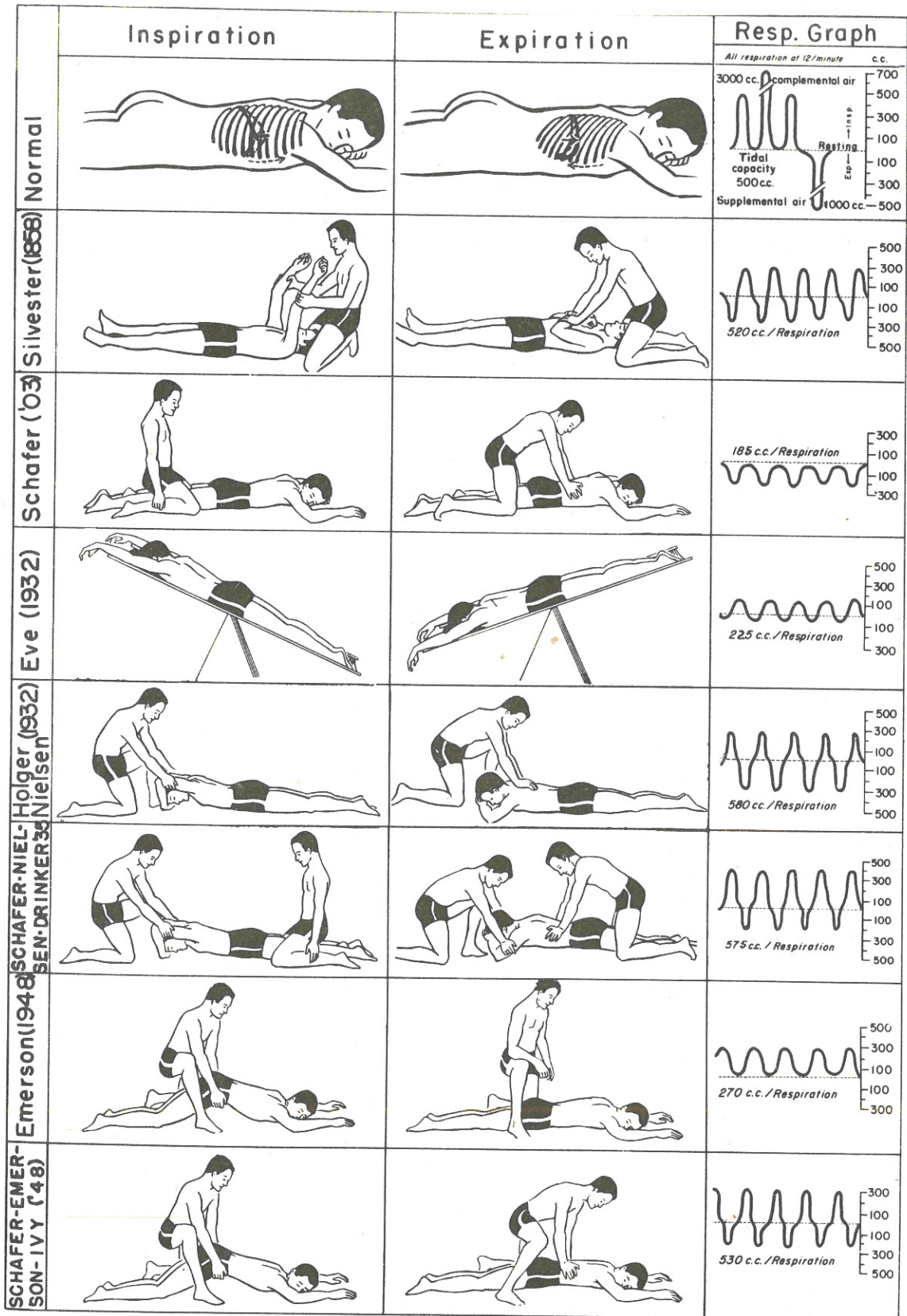


Chart I. Inspiratory and expiratory phases of normal respiration, Eve Rocking Method, and manual methods of artificial respiration with pneumographs produced by each.

CHART IIAdvantages and Disadvantages of Manual Methods of
Artificial Respiration and Eve Rocking Method

ADVANTAGES

DISADVANTAGES

SILVESTER

1. Started immediately.
2. Requires only one rescuer.
3. Requires no apparatus.
4. Provides good pulmonary exchange.

1. Patient supine--airway can become obstructed.
 2. Fracture of ribs and rupture of the liver reported.
 3. Moderately exhausting.
 4. Probably requires specially trained personnel.
-

SCHAEFER

1. Almost universally known and taught.
 2. Simple to learn.
 3. Performed by anyone (including women and children).
 4. Performed for indefinite periods of time.
 5. Excellent results reported.
 6. Requires no equipment.
 7. Instituted immediately.
 8. Uses prone position.
 9. Requires but one rescuer.
-

1. Tidal volume not large.
 2. Fractures of ribs reported.
 3. Active expiration with only passive inspiration.
-

EVE

1. Simple to learn.
2. Performed by anyone.
3. Performed for indefinite time.
4. Accessory treatment can be carried on simultaneously.
5. No fractures of bones or ribs.
6. Uses prone position.
7. Requires one rescuer to rock (but at least 2 to 3 to set up without neglecting patient).

1. Requires proper apparatus.
2. Time lost setting up apparatus if alone.
3. Tidal volume not large.
4. Stomach contents may be poured up into pharynx and subsequently aspirated.

 ADVANTAGES

 DISADVANTAGES

HOLGER-NIELSEN

1. Requires one rescuer only
2. Started immediately.
3. No appliances required.
4. Prone position used.
5. Provides excellent exchange.

1. Not well-known.
 2. Moderately fatiguing.
 3. May cause shoulder injuries or fracture of ribs.
-

SCHAEFER-NIELSEN-DRINKER

1. Similar to established Schaefer method.
2. Can supplement Schaefer method.
3. Uses prone position.
4. Provides excellent exchange.
5. Performed immediately.
6. No apparatus required.

1. Requires two operators to complete operation.
 2. May cause shoulder injuries.
 3. Moderately fatiguing.
-

SCHAEFER-EMERSON-IVY

1. Easy to learn.
 2. Same position as Schaefer.
 3. Can be used to supplement Schaefer.
 4. Excellent pulmonary ventilation.
 5. Performed immediately.
 6. No apparatus required.
 7. Requires only one rescuer.
 8. No additional possibilities of trauma.
-

1. Difficulty in lifting hips for long periods of time.
-

studies reaffirm the fact that no one method of artificial respiration can be offered as a completely satisfactory solution to the problem. There is no doubt, however, that those manual methods utilizing both a "push" and "pull" maneuver are superior. Each of the "push" and "pull" manual methods as well as the mechanical methods used, produced a minute volume of from 5,000 to 6,000 cc. This is the optimum amount; more would result in the disadvantage of hyperventilation. Except for the armamentarium of the anesthetist and of fire or police or rescue crews, all mechanical devices must always be considered as

adjuncts to and not substitutes for manual methods. The manual methods in which the subject lies prone or supine and which utilize both a "push" and "pull" principle provide approximately twice the minute-volume of ventilation obtained with those utilizing a "push" or "pull" principle. The Holger-Nielsen method is more effective than the Schaefer method. Lifting the hips (Emerson) 4 inches with subject prone is more effective than the Schaefer method. When the hip lifting maneuver (Emerson) is added to the lower chest pressure maneuver (Schaefer) to yield a "push" and "pull" method (Schaefer-Emerson-Ivy) it is as effective as the Holger-Nielsen method or the Schaefer-Nielsen-Drinker method. Therefore, those now indoctrinated with the Schaefer prone pressure method can double the ventilating efficiency of the method by lifting the hips 4 inches 12 times each minute alternating with the push on the lower chest. Lifting the hips is fatiguing and after the crucial first several minutes may be employed after every second or third "push" on the lower chest. The newer "Roll-Chest" method is much easier to perform than the "Hip-Chest" method and can be executed for long periods of time. The Holger-Nielsen method is less fatiguing than the Schaefer-Emerson-Ivy method. (A. S. Gordon, D. C. Fainer, and A. C. Ivy, University of Illinois College of Medicine)

Gnirrep describes a method of artificial respiration in which the rocking method of Eve is combined with Silvester's method. Ordinarily Eve's rocking method is carried out with the patient lying on his stomach, which permits expulsion of water. When Eve's and Silvester's methods are combined, however, the patient lies on his back. The author advises that the first few rocking movements be made with the patient on his stomach. The patient is then turned on his back and the two methods combined. The method is easily learned and can be carried out by one or two persons. (W. F. Gnirrep, *Nederlandsch Tijdschrift v. Geneeskunde*, Amsterdam, 29 April '50; abstracted by J.A.M.A., 28 October '50)

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Amputation Above or Below the Knee for Primary Peripheral Vascular Disease: It was found at Queen Mary's Hospital, Roehampton, England, that many patients with below-knee amputations for primary peripheral vascular disease returned with ulcerated and painful stumps. Most of these patients had undergone sympathectomy which, it was supposed at first, might have some connection with their subsequent troubles. An investigation was held, therefore, during which 95 patients were seen who had suffered amputation for thromboangiitis obliterans or arteriosclerosis in many different hospitals. There was no selection of cases except that diabetes and other causes of gangrene were excluded. The inquiry into the cause of painful ulceration of the below-knee stump, though it failed to show a correlation with sympathectomy, revealed a method for determining the proper level of amputation.

The diagnostic criteria used to distinguish thromboangiitis obliterans and arteriosclerosis were: (1) The age at onset of the disease. "True thromboangiitis obliterans" occurs before the age of 35; arteriosclerosis over the age of 50, and in between there is a group of cases showing features common to both. All these 3 groups were found in the present series. (2) Impairment of the circulation in the hand. In arteriosclerosis impairment of circulation in the hand is rare; in thromboangiitis obliterans it has been found in 40 percent of cases. (3) Hypertension. This is rarely found in the early course of thromboangiitis obliterans, but is frequent in arteriosclerosis. (4) Calcification of arteries. Calcification is more common in arteriosclerosis than in thromboangiitis obliterans. (5) The gross microscopic appearances of the vessels in the amputated limbs. These are almost conclusive in the author's opinion though challenged by others.

In the 95 cases studied, there were 43 bilateral amputations, and thus 138 stumps. Apart from 3 amputations of toes only, 83 stumps were above the knee, and 52 below. Twenty-nine unsatisfactory below-knee stumps had already been re-amputated above the knee, making a total of 81 primary below-knee stumps.

Three criteria were used in classifying the stumps for evaluation: the state of the skin (3=normal, 2=thin, shiny or scaly, and 1=ulcerated; pain (3=none, 2=occasional, 1=persistent); the ability to wear an artificial limb (3=unimpaired, 2=impaired for some of the time only, 1=impossible). Stumps graded 3 under each heading were classed as satisfactory. Of the 83 above-knee stumps, 75 were satisfactory and 8 were not. Of the 81 below-knee stumps, 29 had already been re-amputated above the knee, 27 were satisfactory and 25 remained unsatisfactory. What is striking is not so much the preponderance of good above-knee amputations, as the fact that one-third of the below knee stumps remained satisfactory. Thus, in a disease notoriously affecting both lower limbs there is sometimes a reasonable chance of conserving a substantial part of the limb and so avoiding the great disability caused by amputation through both thighs.

Relevant factors in selecting cases in which below-knee amputation offers a reasonable prospect of success are: (1) Age. All the satisfactory below-knee stumps were in patients under 52 years at the time of amputation; all of the 9 patients older than this had defective stumps. (2) The popliteal pulse before operation. Of 15 patients in whom the pulse was known to have been present before operation, only 1 showed an unsatisfactory stump. In all 15 cases bleeding at operation was very brisk. The single unsatisfactory stump ulcerated 18 months after amputation during a recrudescence of thromboangiitis which also involved the fingers of both hands. Popliteal pulsation was seldom found in these patients later than 6 months after amputation; the postoperative absence of a pulse is therefore of little significance. The preoperative absence of the popliteal pulse is not in itself an omen of failure, however, for there were 13 satisfactory stumps in this group. At operation bleeding had again been profuse

and the muscles had appeared healthy. (3) The vascularity of the part as seen at operation. This was the crucial factor. If bleeding had been brisk the stump proved satisfactory, but after little or no bleeding the stump proved unsatisfactory. This applied to both above- and below-knee stumps. Survival depends, therefore, on the state of the circulation, main or collateral. Some simple and reliable means of assessing the circulation before operation should indicate when a below-knee amputation is likely to be successful.

Three tests were employed to assess circulation before operation: (1) The skin temperature as determined by palpation. An obvious boundary between warmth and cold is frequently found in limbs when symptoms and signs indicate amputation. (2) Reactive hyperemia. The limb is elevated until it is pallid, and a sphygmomanometer is then placed around the thigh and inflated to above the systolic pressure. After an interval of not less than 5 minutes, during which the limb is kept warm, the sphygmomanometer is released and the zone of flushing that occurs within 5 minutes is observed. (3) Oscillometry. This provides useful but only confirmatory evidence, particularly of the absence of pulsation immediately above and below the knee.

The final criterion, if the tests indicate the possibility of a successful below-knee amputation, is the state of the circulation as observed at operation. In order to eliminate the possibility of vascular spasm, no tourniquet should be used. Free bleeding shows that the stump should survive. The appearance of the muscle is also important. If it is pinkish-gray, homogeneous, and does not bleed, it is useless to proceed with amputation below the knee. There must inevitably be borderline cases, but it should be safe to proceed if the color of the muscle is normal, and if the cut surface is covered by an ooze of blood immediately after swabbing.

In this series, 4 cases examined fully before amputation satisfied the criteria both before and at operation, and all have satisfactory below-knee stumps. It was noted in each of them that the temperature boundary found at palpation and the lower limit of the rapid hyperemic flush coincided with the level below which the muscle was ischemic. In each case the site of amputation was more than 6 inches above this zone.

The length of the stump has some bearing on the survival of the stump, which should be as short as can be compatible with satisfactory limb-fitting. The lengths of the satisfactory below-knee stumps, measured from the joint line, varied from 4 to 6 inches. A 4-inch stump seldom presents any problem to the limb fitter, and does not reduce the efficiency of the artificial limb. Stumps shorter than this do present problems. The 4-inch stump is rather more square than the conical one after amputation at the site of election, but tight bandaging produces good distal shrinkage. There is no indication for excision of the fibula, which provides an eccentricity of outline tending to prevent rotation of the prosthesis--a matter of particular importance if the amputation is bilateral.

The 50 below-knee stumps which actually ulcerated were all ischemic, i.e., they were cold and there was no demonstrable circulation. Forty-two ulcerated within a year of amputation. Three stumps broke down after two years as a result of direct accidental injury. It seems that if a below-knee stump is going to give trouble spontaneously, it will do so within the first year. Furthermore, re-amputation below the knee offers little prospect of success. There were 17 cases in which this had been done and none was successful; 2 of them had been trimmed more than once--a finding that does not encourage the practice of making a stump long enough to allow below-knee trimming in the event of failure.

Of the 54 unsatisfactory below-knee stumps, 29 had been re-amputated above the knee; 23 of these were satisfactory. The remaining 6 re-amputations were not, again because of ischemia; all of the stumps were long, and 4 of these patients had pain indistinguishable from that of intermittent claudication. It is clear, therefore, that even in thigh amputations the state of the circulation must be the guide to the level of resection. (J. Bone & Joint Surg., (Brit. Vol) August '50, H. G. Smith)

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Nail Design. An Important Safety Factor in Intramedullary Nailing; Some of the factors affecting the incidence of fat embolism in fracture patients treated with intramedullary nailing are presented.

It has been estimated on the basis of postmortem studies that as little as 12 to 20 Gm. of fat appearing in the lungs as emboli could produce serious symptoms and even death. Three conditions are essential for the production of fat embolism. These are: (1) the rupture of the fat cells; (2) the existence of venous channels by which the fat globules can reach the general circulation; and (3) an increase in the local tissue pressure to force the fat globules into the venous channels. The first 2 conditions are abundantly realized by the insertion of any intramedullary prosthesis with the consequent disruption of the bone marrow. The increase in local tissue pressure is the most essential and variable factor in the production of fat embolism, and it is this factor which is most affected by the design of the intramedullary nail.

Two types of intramedullary nails are readily available for use in fixing femur fractures, the hollow "cloverleaf" design extensively used in Europe, and the solid "diamond" design introduced in 1947. Examination of nails of these two designs provoked the interesting speculation that the design or cross-sectional pattern of the nail should affect the production of fat embolism. Unfortunately, there exists no large series of cases treated with intramedullary nails of solid design which can be compared with the thousands of cases treated with the hollow nails to determine the incidence of fat embolism.

The pressures occurring in the intramedullary canal of tibias from fresh amputation specimens during the insertion of an intramedullary nail were measured, using hollow cloverleaf nails and solid diamond nails of similar caliber. The nails were inserted immediately in front of the tibial spines through a drill hole which pierced the tibial plate, but did not penetrate the metaphysis. Pressures were measured by means of a capillary mercury manometer attached to a needle placed in the medullary cavity through a small hole in the cortex at the mid-point of the diaphysis. The nails were driven the full length of the shaft with blows of a hammer. The manometer was read continuously during insertion and the maximum readings recorded.

Important differences between intramedullary nails of a hollow and a solid design were immediately evident. Both the volume displacement and the intramedullary pressure during insertion were considerably greater with the solid designs. A solid diamond nail 40 cm. long displaces 20 cc. of fatty marrow, and, during its insertion, the intramedullary pressure reaches 162 mm. Hg. A hollow cloverleaf nail of similar caliber 40 cm. long displaces 12 cc. of fatty marrow, and, during its insertion, the intramedullary pressure rises to 73 mm. Hg. The fat displaced by the hollow nail is provided with easy access to the wound of insertion, while the fat displaced by the solid nail finds this avenue of egress blocked. Since the danger of fat embolism is directly related to the amount of fat available for embolization, and to an increase in the local tissue pressure, it can be seen that the use of a hollow nail provides a greater margin of safety than does the solid nail because: (1) the volume displacement is smaller; (2) the drainage of the medullary canal is more effective; and (3) the intramedullary pressure arising during insertion is less. (Surgery, October '50, L. F. Peltier)

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Osteochondritis of the Spine: Osteochondritis of the spine has been known by various names (osteochondritis dorsalis juvenilis, kyphosis juvenilis, osteochondrosis of the spine, Scheuermann's disease, vertebral epiphysitis, Calvé's disease of the spine, and vertebra plana). The osteochondritis may involve either the primary centers of ossification of the vertebral bodies or the superior and inferior osteochondral plates with their secondary centers of ossification, the so-called "ring epiphyses." This last is the more common condition and considered to be similar to other osteochondritides which develop at the sites of epiphyses or secondary centers throughout the body. Involvement of the osteochondral plates and the secondary centers of ossification of the body characteristically produces wedged, deformed vertebral bodies and resultant kyphoses.

Cases with involvement of the primary centers of ossification are quite rare, characteristically occur in the first decade of life, and involve a single vertebral body which may collapse almost completely, leaving a wafer-thin

osseous plate. Cases with involvement limited to the region of the secondary center of ossification of the vertebral bodies, usually occurring in the lumbar region, are commonly referred to as "epiphysitis" and considered to be a separate entity by some. In appearance, they resemble an ununited avulsion fracture of the "epiphysis."

There is no definite evidence to indicate that osteochondritis, despite its name, is an inflammatory process. It develops during the period of most active growth of the areas of involvement, peak incidence in 1 series being 15 to 16 years. Its exact etiology is unknown. The importance of continued malnutrition during the years of rapid growth has been shown. In several cases, osteochondritis of the spine has accompanied osteochondritis at other sites. A number of instances have also been reported of several members of the same family developing such lesions, suggesting an hereditary factor. Trauma is probably a very important factor.

Several of the author's patients were admitted to the hospital with transfer diagnoses of vertebral fracture. The onset is usually heralded by pain in the back, associated with a sensation of "tiredness", which may not be severe. There may be no discomfort until some time after diagnosis has been made. Discomfort is aggravated by erect posture and heavy work and relieved by lying down. The persistence of pain, associated with developing kyphosis, stiffness, and fatiguability ultimately leads to diagnosis. With military personnel a carefully taken past history will usually reveal some symptoms to indicate that it had been present prior to entrance on military service. Examination will reveal a variable degree of kyphosis, absence of fever or other evidence of systemic disease, fairly good general condition, and muscle spasm and localized tenderness if the process is active. Laboratory findings are within normal limits and the clinical course is usually one of fairly rapid improvement with appropriate treatment. In some cases, especially in the healed stage, it is an incidental finding unrelated to the injury which brought the patient into the hospital, but its rather striking roentgenological appearance, particularly if the patient desires release from the service, may make it difficult to rule out a cause and effect relationship.

Treatment will depend on the severity and stage of the disease. Hyperextension by casts, braces, or a suitable bed, together with corrective exercises, will be needed in the active phase. Calvé stresses the importance of preventing, if possible, compensatory lordosis in the lumbar region, with its undesirable sequelae. Prognosis is excellent for healing and an occasional case treated early may be restored completely to normal, although there is usually some residual deformity. (Mil. Surgeon, October '50, Col. P. O. Wells, MC, USA)

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Maternal Pulmonary Embolism by Amniotic Fluid: The authors report 3 cases of this unusual complication of pregnancy and have reviewed the literature and summarized 17 previously reported cases. It is believed that these 3 cases are the first cases proved by autopsy to have occurred in Massachusetts.

Maternal pulmonary embolism by amniotic fluid was first described by Steiner and Lushbaugh in 1941. These authors based their report on a study of 8 cases in human beings and also successfully produced the picture by intravenous inoculation of amniotic fluid and meconium into dogs and rabbits. In 1942 they presented 2 additional cases and since then other studies have brought the total number of cases reported up to the present report to 17.

The characteristic clinical picture of pulmonary embolism by amniotic fluid follows: The patient is frequently a multipara in the older age group. The prenatal course is uneventful and usually no complications occur before labor starts. Often the pregnancy has lasted beyond the expected date of confinement and even when this is not so the fetus is usually larger than normal. Uterine contractions are hard, violent, or tetanoid. The signs and symptoms begin during or shortly after labor. The first symptom is a subjective chilliness, the blood pressure drops to shock levels and the patient becomes restive and anxious. Dyspnea and cyanosis develop. Response to treatment is poor, with death in a few minutes or hours. The fetus is often stillborn or dies shortly after birth.

Although the clinical diagnosis has rarely if ever been made, such a diagnosis should be possible for those familiar with the syndrome. The diagnosis is made pathologically by the finding of formed elements of amniotic fluid in the pulmonary and alveolar capillaries.

Since to date cases of this disorder have not been recognized prior to death and autopsy, there is no report of one successfully treated. In cases of massive embolism causing anoxia on a mechanical basis it is unlikely that a satisfactory form of treatment can be devised. Borderline cases might be saved by supportive measures and oxygen. Vasodilatory or antihistamine drugs might be of aid. From the prophylactic standpoint it appears logical not to induce violent labor by pituitrin and to prevent it, if possible, in elderly multiparas, particularly those who have had a premature rupture of the membranes. (New England J. Med., 19 October '50, G. K. Mallory et al.)

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Intravenous Use of Quinidine, with Particular Reference to Ventricular Tachycardia: The efficacy of quinidine in the treatment of paroxysmal ventricular tachycardia has been established by others. The purpose of this study was to determine the relative safety of quinidine lactate when given intravenously.

The following were considered to be valid indications for the intravenous use of quinidine:

1. A critically ill patient, usually with ventricular tachycardia, in whom oral quinidine had been ineffective or whose condition was so serious that there was no time for trial of the drug by mouth.
2. A patient in whom surgery of the chest or heart, of a type necessitating cardiac manipulation, was to be performed. In such cases, the patient was given oral quinidine preoperatively. If tolerated, quinidine lactate was added to the intravenous fluids during operation.

In the 13 patients treated by the author, the dose varied from 0.4 Gm. to 3.25 Gm. The smallest dose given to a patient with paroxysmal ventricular tachycardia which was followed by return to regular sinus rhythm was 0.8 Gm. Three patients became nauseated and vomited during or immediately following the intravenous administration of 0.4 Gm., 0.65 Gm., and 2.6 Gm. There were no other signs or symptoms even slightly suggestive of quinidine toxicity in the series of over 30 intravenous doses given the other 8 patients. In this clinical study, as in others, it is most difficult, if not impossible, to differentiate phenomena as being secondary to the medication or to the disease. One of the patients had also vomited on several occasions before receiving quinidine. Since nausea and vomiting are by no means specific reactions, their occurrence alone should not be interpreted unequivocally as evidence of a reaction to quinidine. Asystole, convulsions, cyanosis, shock, impaired vision, and unconsciousness were not encountered in this series of patients. It is possible that many of the severe reactions described in the literature were the result of the disease, impurities in, or too great a concentration of, the intravenous solution, or its too rapid administration. Unfortunately, it is impossible to prove or disprove this theory.

Several authors have found quinidine effective in abolishing ventricular tachycardia only when given with intravenous digitalis or one of its derivatives. Others mentioned the beneficial effect of atropine. Stemplen and Katz treating 1 patient with paroxysmal ventricular tachycardia found intravenous quinine dihydrochloride alone and with atropine ineffectual. When potassium chloride was added, the rhythm promptly returned to normal.

Some physicians prefer intramuscular to intravenous quinidine therapy, claiming that the former is less dangerous. Admitting the potential danger of both, the author prefers intravenous administration because when properly administered (well diluted and given slowly under constant observation), intravenous quinidine lactate can be discontinued immediately upon the restoration of normal rhythm or the first sign of toxicity. Quinidine given intramuscularly, on the other hand, is not subject to such control and the dose, once given, must be allowed to continue for its full effect. (Am. J. M. Sc., October '50, A. H. Clagett, Jr.)

Oxygen Therapy of Bundle Branch Block: The preponderant opinion concerning the etiology of bundle branch block is that it is an expression of cardiovascular disease, mainly caused by the arteriosclerotic narrowing of a coronary branch supplying the bundle of His. Occasionally, rheumatic heart disease, diphtheria and hypothyroidism are found to be the basis for the disturbance and among the rarer conditions resulting in this abnormality are congenital heart disease, syphilis, endocarditis, and toxicity from drugs, such as quinine, digitals, and thyroid. On the other hand, in routine electrocardiography, bundle branch block may be discovered in young adults and in middle aged people without any evidence of heart disease. Although the possibility of an anomalous course of the distribution of the branches and the terminals of His' bundle might be considered in such cases, yet all instances of bundle branch block cannot be explained on an anatomical basis.

Regardless of the presence or absence of a pathological basis, the electrocardiographic changes can be attributed to a variety of physiological factors. Among these, may be mentioned the fatigue and recovery time of the conduction fibers, the state of nutrition and the degree of oxygenation of the cardiac musculature, the calcium and phosphorus metabolism of the cardiac tissue, and the vagal influence through an increase in the cardiac rate and vasomotor changes, such as induced by sudden fright. Although it has long been known that all patients with bundle branch block do not necessarily have to be considered with grave prognosis, many living many years unaware of the existence of their condition, the treatment of the bundle branch block and its eradication will aid in restoring many others to a normal life.

The presence of bundle branch block does not influence the treatment of the causal lesion; nevertheless a better understanding of the circumstances producing the abnormal electrocardiogram will obviate a nihilistic attitude regarding its therapy. There have been numerous reports of the spontaneous return of bundle branch block to normal conduction, lending credence to the belief that the bundle branch block was "transient" or "paroxysmal" in nature and of little import to the subsequent health of the individual. Even when no anatomical cardiac lesion may be detected however, the periods of bundle branch block are primarily due to abnormal changes in the conducting tissue and therefore should be regarded as a manifestation of heart disease. One or several physiological factors may be responsible for the appearance of the disturbed conduction, and each factor must be investigated and eliminated.

Some patients may return to normal conduction with bed rest or limitation of activity. Other patients may respond to diuretic therapy. The most common methods of eradication of bundle branch block have been by the application of carotid sinus pressure, or the administration of acetylcholine. But in all such cases, the bundle branch block returned when the cardiac mechanism resumed the critical rate that initiated the disturbance. The most rational approach to the problem is to administer oxygen by inhalation. Although this type of therapy

will not clear up the bundle branch block in patients whose conducting tissue has been irreparably damaged by disease, such damage may be prevented by the early and prolonged use of oxygen.

Resnik demonstrated that anoxemia caused changes in the intraventricular conduction of a normal heart by a direct effect on the myocardium. Furthermore, the appearance of the stage of impaired conduction was favored by the condition of the heart, the rate at which the heart beats, the degree of anoxemia, and the length of time to which the heart was subjected to asphyxia. Several years earlier, Barach and Woodwell demonstrated the beneficial effects of oxygen inhalation in 2 patients with bundle branch block who were cyanotic due to severe myocarditis and cardiac insufficiency. The electrocardiographic changes indicated a lesser degree of block during and following the inhalation of oxygen. The good results were attributed to an improved circulation due to the elevation of oxygen saturation of the arterial and venous blood to the normal level. Later, Baker was able to eradicate the bundle branch block of a patient following 5 minutes of oxygen inhalation. In addition, during oxygen inhalation, although the cardiac rate could be increased well above the point provoking delayed conduction in all previous observations, the normal ventricular complexes prevailed. However, this type of therapy has received little, if any, support in recent years, although no actual evidence opposed to it has been presented. (Am. J. M. Sc., October '50, J. Levy)

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Chlorophyll as an Adjunct in the Management of the Permanent Colostomy;

Patients with a permanent colostomy usually learn to control it in such a way that embarrassment from an involuntary passage of gas or feces hardly ever occurs. Nevertheless, there is often a period of a number of weeks when an agent to deodorize the colostomy effectively would be very welcome. This is particularly true for patients who are able to resume their usual activities before the colostomy is completely under control. In casting about for a suitable substance to overcome this problem, it seemed that chlorophyll might answer the requirements.

Chlorophyll in solution, with a wick as an absorbent, has been widely and effectively used to remove various undesirable odors. Furthermore, numerous investigators have shown that chlorophyll is harmless to living tissue, and some have even claimed that it exerts a beneficial effect upon wound healing.

A capsule containing 60 mg. of powdered chlorophyll and 360 mg. of colloidal kaolin has been used by 18 patients with permanent colostomies. No undesirable change in the character of the stool or in bowel habits has been noted by any patient, nor have there been untoward side effects of any description. All of the patients reported favorably upon the performance of these capsules, and in each instance the patient has felt secure enough in their use to resume his daily activities without fear of embarrassment. (Surgery, September '50, J. M. Goodman)

Irreducible Intussusception due to Meckel's Diverticulum. Report of a Case with Recovery in an Infant Eight Months Old: Intussusception is a relatively common surgical emergency but its combination with Meckel's diverticulum as the causative factor, although not rare, is sufficiently uncommon to be worth recording, especially in an infant in whom the intussusception has been irreducible.

Harkins (1933) in a study of literature was able to find 160 cases of intussusception due to Meckel's diverticulum; of these 76 were irreducible, and only 6 were in infants under 1 year of age. In the majority of reported cases reduction of the intussusception and removal of the diverticulum has been possible. In only a small proportion has resection or other procedure been necessary. It is believed by Romanis and Mitchener that such intussusceptions are commonest in children between 3 and 10 years of age with the sex incidence preponderantly male. All authors are agreed that the enteric type of intussusception carries the highest mortality rate regardless of the treatment adopted and that the figures rise steeply in the younger age groups.

The author reports a case of irreducible intussusception due to Meckel's diverticulum in a female infant only 8 months of age. The child was operated upon 2 hours after admission to the hospital. On opening the peritoneum free clear fluid escaped. The distended jejunum and collapsed and empty colon were identified. A mass was palpated in the pelvis and easily delivered from the wound. The mass was found to be an enteric intussusception 4 inches long with its apex about 10 inches from the ileocecal valve. Palpation of the intussusception revealed a solid and moveable object inside the bowel lumen. This was thought to be a polyp or a Meckel's diverticulum. Reduction was attempted but had to be abandoned because of the gross splitting of the peritoneal coat of the sheath and the leakage of gangrenous material and bowel contents from the neck of the intussusception. Therefore, the mass was resected and a side-to-side anastomosis performed. The wound was closed without drainage. The infant had a somewhat stormy recovery but with antibiotics and other careful treatment the child was discharged home on the 31st day. Her present condition is excellent but a small hernia is present.

Examination of the removed specimen revealed an enteric intussusception containing an inverted Meckel's diverticulum, the distal end of which was grasped by the apex of the intussusception. The diverticulum had a dilated end and a thin stalk. The base of the diverticulum had not entered the intussusception. There was no gross evidence of a causative tumor.

The author comments that: (1) Harkins (1933) stated all writers on intussusception due to Meckel's diverticulum have noted the frequent history of previous abdominal crises (which was present in the reported case). (2) Pain is always of a colicky nature and usually a very marked symptom in this type of intussusception. (3) Vomiting appears to be a marked symptom. (4) Diarrhea

is not a feature usually but absolute constipation from the onset is a frequent symptom. However, in the reported case diarrhea was observed for about 5 days, although absolute constipation was present 24 hours prior to admission. (5) No tumor was palpable in the abdomen but a mass could be felt on rectal examination. (6) It has been reported of previous cases that blood in the stools were a prominent feature resembling ordinary intussusception; however, Harkins' series showed bloody stools in only 43 out of 160 cases and in the present case blood was found only on digital rectal examination. (7) Fever appears to be an insignificant feature in the reported cases. (8) It is impossible to make a pre-operative differentiation between intussusception due to Meckel's diverticulum and the ordinary enterocolic types; this is especially true when the patient is a small baby.

The author suggests that resection and side-to-side anastomosis is the treatment in such a case as herewith reported. (Glasgow M. J., August '50, J. Aitken)

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Warfarin for Control of Rats and Mice: Warfarin, compound 42, or WARF-42, is a chemical belonging to a class of anticoagulant compounds of which dicumarol is the most widely known. Warfarin reduces or prevents clotting of the blood when consumed in very small quantities over a period of several days and in most cases produces painless death to animals by causing internal bleeding. The accepted chemical designation is 3-(alpha-acetonylbenzyl)-4-hydroxycoumarin. In this form it is a stable grayish-white powder, slightly soluble in water. It is tasteless and odorless in the concentration ordinarily used for rodent baits.

Experimental studies indicate that it is an effective poison for the control of Norway and roof rats and house mice. There is yet no indication that the animals develop either an aversion or tolerance after repeated feedings. Because of these characteristics, permanent-type baits have been successfully employed in self-feeder devices not only to rid structures of rodents, but also to destroy other rats and mice as they invade the premises.

Warfarin will not give effective control when applied in a single dose. It must be ingested several times (usually 5 or more) on successive days. The feedings need not be consecutive, but should occur within a 10-day interval with no period longer than 48 hours between feedings. Because baits may not be accepted when first exposed, from 5 to 14 days may elapse before satisfactory control is attained. Usually, however, a marked reduction in bait consumption and damage occurs after the 3d day of treatment.

There appears to be a minimum danger to other animals in the concentration used and recommended (0.025 percent) and potential hazard may be further reduced by using grain or cereal type-baits which are unattractive to most flesh

eating animals. It is recommended in the presence of other animals that warfarin baits be exposed only in protected bait stations or other covered devices which will permit feeding by rodents but prevent access by larger animals. No accidents to humans have been reported. However, baits should not be exposed in locations accessible to children or irresponsible persons. In case of accidental ingestion, vomiting should be induced at once and a physician called. Treatment should include whole blood transfusions and intravenous and oral administration of vitamin K preparations as in the case of hemorrhages from dicumarol.

Warfarin has now been released for sale to the public as a 0.5 percent concentrate. One pound of the preparation should be mixed with 19 pounds of bait to provide the recommended concentration of 0.025 percent. The present form of the chemical should not be employed in water baits or as a tracking powder.

It is emphasized that: (1) Warfarin is not a miracle poison. (2) It must be consumed by the rodents in small quantities over a period of several days to produce death. (3) Cereal-type baits such as ground whole yellow corn meal or a mixture of equal parts of the yellow corn meal and rolled oats have given good results. (4) While warfarin provides one more useful tool for rodent control, the permanent solution of the rat menace still requires strict adherence to the principles of food and shelter elimination. (5) The use of other rodenticides may be still desirable to produce immediate kills, and to reduce heavy infestations prior to follow-up use of the new chemical. (U. S. Dept. Interior Bull., 7 August '50)

Note: It is expected that warfarin will be added as a stock item in the Catalog of Navy Material. (Preventive Med. Div., BuMed)

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Management of Pleural Tears During Thoracoplasty: A method for closure of pleural tears during thoracoplasty which allows rapid expansion of the lung and early removal of air and fluid from the pleural space is presented. A major complication during the postoperative period, depending upon the pulmonary reserve of the patient, may result from such pleural tears. In good-risk patients with unilateral involvement, minimal pulmonary secretions, and good respiratory function, the addition of a traumatic pneumothorax is not hazardous. If the hemopneumothorax absorbs slowly, a fibrous peel may envelop the lung and its parietes with consequent impairment of respiratory function. In the poor-risk patient with marked secretions and low respiratory reserve, the additional reduction in function imposed by a hemopneumothorax may be serious and lead to severe anoxia and irreversible pulmonary edema. In the early postoperative period, complicating factors such as mediastinal shift and contralateral

atelectasis may further embarrass respiration so that maximum respiratory function of the ipsilateral lung is urgently needed.

While the author was attempting a thoracoplasty over a pneumonic right upper lobe, a pleural tear resulted in dislocation of the upper lobe below the level of the hilum. In order to reduce the number of resected ribs necessary to collapse this lobe, a catheter was inserted into the pleural space and suction applied. Complete re-expansion of the lung followed, with the right upper lobe rising into the apical paravertebral gutter. No pleural effusion developed. All subsequent pleural tears have been treated by intrapleural catheter drainage instituted at the time of operation. As a result, the pneumothorax is absent at the end of the operation, the extrafascial fluid seeping into the pleural space is removed quickly, and no secondary pleural effusion follows.

The technic is simple, requires no special instruments, and can be performed in a few minutes. No attempt is made to close the pleural tear, although it may be plugged with a sponge temporarily. As soon as the opening is discovered, an aspirating needle is inserted through an exposed intercostal space approximately at the midaxillary line one or two interspaces below the lowest rib to be resected. If a pneumothorax space is found, a trocar cannula is inserted, a small urethral catheter (French 14 or 16) is fed into the pleural cavity, and immediately connected with an underwater drainage bottle. After rib resection is completed, but prior to closure of muscle layers, a small incision is made in the skin and the catheter is extracted through this opening. A silk mattress suture is placed in the skin wound about the catheter and is tied later when the catheter is removed. The catheter is again attached to underwater drainage, and, when the patient is returned to the ward, continuous mild suction may be applied. The author has placed 4 to 8 cm. of catheter within the pleural space and it appears to function as well as one with the tip inserted just beyond the parietal pleural wall. The lung expands, quickly closing the tear, and the pneumothorax is completely removed by the end of operation. Fluid in the subscapular space will continue to seep into the pleural space for approximately 24 hours and it is, therefore, desirable to continue suction drainage during this period.

There have been no complications following the use of intrapleural catheter suction for pleural tears. The patient experiences no additional pain or discomfort. Roentgenograms taken immediately after operation have shown no trace of pneumothorax. The rapid expansion of the lung closes the pleural tear and allows the subscapular fluid to accentuate the collapse. Aspirations of the pleural space have not been necessary in any case, and in only 1 instance has there been enough fluid or reaction to produce obliteration of the costophrenic sulcus. The immediate drainage is bloody, but the total drainage is serohemorrhagic and has been less than 100 cc. in all cases. This would suggest that the mechanism of large pleural effusions following a pleural tear is not due to

the original small amount of hemorrhagic fluid seeping into the pleural cavity, but to the pleural exudation stimulated by the presence of blood. (Surgery, September '50, E. Michelson)

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Serum Cholinesterase Determination in the Differential Diagnosis of Jaundice: The activity of serum cholinesterase is depressed in patients with liver disease. The enzyme present in the serum, which is capable of hydrolyzing acetylcholine, is a nonspecific cholinesterase, therefore differing from that of the erythrocyte and central nervous system. Because of reports that the liver is the main site of synthesis of this nonspecific enzyme, attention has been focused on this type of cholinesterase in relation to liver disease and the differential diagnosis of jaundice.

Determination of cholinesterase by either the manometric titration or photometric method is rather difficult; therefore, neither of these has been found desirable as a routine test. Michel has recently described a simple potentiometric method which depends on the change in pH caused by liberation of acetic acid in the hydrolysis of acetylcholine by cholinesterase. A slight modification of Michel's method was used because the details of Michel's method were not available to the authors at the outset of this study. A simple practical procedure based on the electrometric method of Gilman and on a preliminary report of Michel's procedure was developed. In addition to a study of this method in a series of cases of jaundice and liver disease, an attempt has been made to correlate the authors' results with other clinical and laboratory features believed important to the differential diagnosis of jaundice.

Details of this method follow:

Substrate: 10 percent solution of acetylcholine bromide in distilled water. This solution is kept in a refrigerator and renewed about every 10 days to avoid hydrolysis.

Buffer: 4.240 Gm. of barbitol sodium and 5 Gm. of sodium glycerophosphate are dissolved in about 900 ml. of distilled water; 2.4 ml. of a 10 percent solution of HCl are added, and the volume is made up to 1,000 ml. with distilled water. The pH of this buffer should be 8.00 at 25° C.

Method: 1 ml. of the substrate solution is added to 0.2 ml. of serum, fasting sample, in 10 ml. of buffer. The mixture is incubated for an hour at 37° C. The amount of acetic acid liberated during this period of time, expressed by the lowering of the pH of the solution, is measured with a Beckman pH meter at 25° C. The difference in pH before and after incubation, minus the correction factor for the nonenzymatic hydrolysis, as described below, is the cholinesterase

value in pH units. For example, a decline from pH 8.00 to 7.48 equals a total value of 0.52. Subtracting 0.04 (correction factor for pH 7.50), a value of 0.48 is obtained for cholinesterase in pH units.

The correction values for the nonenzymatic hydrolysis are based on the average of at least 3 determinations, using Veronal buffer at decreasing pH. The amounts and time of incubation were the same as used in the determination of the enzymatic hydrolysis. The values are similar to those reported by Michel.

This report comprises 211 determinations of serum cholinesterase. The normal group consisted of 50 apparently normal individuals. A second group was formed by 157 determinations in patients with jaundice or liver disease (40 cases of cirrhosis, 50 cases of obstructive jaundice, and 72 determinations in 24 cases of infectious hepatitis). In the majority of cases the diagnosis was established by operation or autopsy, or by needle biopsy, and in the remainder the clinical and laboratory features were regarded as characteristic.

The probability that nonspecific cholinesterase is produced at least mainly in the liver cells would appear to establish an advantage of the cholinesterase determination over such tests as thymol turbidity, zinc turbidity, and cephalin-cholesterol flocculation, which actually indicate nothing more than abnormality in the serum proteins (although, very often of course, this is a reflection of liver injury).

Cholinesterase determinations can be used to advantage in the differential diagnosis of jaundice. The present finding that a high percentage of cases with benign extrahepatic obstruction have normal values, in contradistinction to the low values in malignant obstruction, is important from the diagnostic standpoint. The low values characterizing the cases of malignant obstructive jaundice exclude the possibility of using this test alone to differentiate between this type of jaundice and parenchymal jaundice. In this particular problem, the relative normality of the other liver functional tests, together with history and physical findings, usually assists in pointing away from a primary diffuse hepatic disease.

Regarding the interpretation of the low cholinesterase value in obstruction due to carcinoma of the pancreas or ampulla, it is questionable whether liver injury is responsible, since hepatocellular damage is relatively mild so far as can be determined by other methods. The possibility exists, however, that the duration of jaundice and degree of increase of intrabiliary pressure are the important factors. The latter, of course, is nearly always much greater with malignant than with benign obstruction. One of the 2 exceptions previously mentioned would be in accord with this concept, that is, a case of common duct stone with complete biliary obstruction and a low serum cholinesterase.

In general the present data indicate the correlation of the cholinesterase values with the severity of the liver injury, and hence with prognosis. The lowest value in the hepatitis cases was in a very severe instance of hepatitis which progressed to an acute necrosis of the liver and death. It was of interest that in those cases of hepatic damage complicating an infectious mononucleosis, the values were rather close to the normal limit. This agrees with the common experience that liver injury in this disease is relatively mild.

The reason for the peculiar behavior of the cholinesterase curve during early convalescence of hepatitis is not clear. The fact that the cholinesterase value transitorily attained a relatively normal peak early in convalescence in 4 cases in which serial data were obtained appeared to indicate improvement and suggests that this peak in itself is an indication that the patient will recover. In the only fatal case of the series, as already referred to, no increase of serum cholinesterase was observed at any time. (J. Lab. & Clin. Med., September '50, J. M. O. Alcalde)

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The Treatment of Syphilis of the Masses: During 1949 the author made a venereal disease survey throughout Southern Rhodesia and also studied venereal disease problems at first hand in the Union of South Africa, Egypt, Turkey, Syria, Lebanon, East and West Pakistan, and Iraq. Attention was constantly focused during this time on problems of syphilis of the masses. His two sharpest impressions were: (1) syphilis as a nonvenereal complaint is much more common than is generally realized; and (2) since the evolution of simplified, effective treatment for venereal syphilis has quite outstripped the installation of proper diagnostic facilities, modern treatment will, in general, have to be applied in spite of this limitation.

Extravenereal Syphilis. Apart from yaws and pinta (which are often considered to be separate from syphilis, although some, e.g., Hudson, postulate that they are caused by the same organism, Treponema pallidum), there are other diseases of an intermediate nature which have also been described. One of these is the bejel of the Euphrates Arab, considered to be a local form of treponematoses, which may be affecting a million persons in Iraq, particularly the children. The usual clinical signs are of the secondary type, with genital and perianal condylomata, genital and oral mucous patches, split papules at the angles of the mouth, bone pains, and laryngitis. Later complications are usually gummatous (particularly of the soft palate, nasal septum, bones, and soft tissues).

In Southern Rhodesia a disease is encountered locally called njovera, which primarily affects children and manifests itself by anogenital condylomata, mucous patches in the mouth, and split papules at the commissures of the lips. Organisms resembling T. pallidum may be found by darkfield illumination, and the serum tests for syphilis are positive. Late complications include gangosa-like

lesions and gummata of the palate and other sites. No primary sores were observed in the children but an occasional "throw-back" was seen as a nipple chancre in the mother of a breast-fed infected child. It is believed that njovera is a nonvenereal form of syphilis and similar to the bejel of the Euphrates Arab.

Such nonvenereal forms of syphilis extend beyond the limits covered by the peoples mentioned. Apparently, it is prevalent in Bechuanaland, East Africa, the Balkans, Afghanistan, Scandinavia (radesyge), and Turkey. History also tells us of the sibbens of Scotland and of a similar condition encountered during the early settlement of Canada. Hudson believes that the spread of the disease is due to close nonvenereal contact, aided by filth, flies, and conditions of overcrowding. A definite increase in extravenereal syphilis of children was noted in postwar Budapest by Féjer. In Chicago, in 1947, 20 cases of asexual syphilis in children were noted by Eisenberg *et al.* In these American cases, as in bejel and njovera, there was again an absence of the primary stage, and overcrowding was believed to have been responsible. Thus, whatever the final verdict concerning the relationship of yaws and pinta to syphilis (there appears to be some justification for giving these diseases separate labels, although the *in vitro* immobilization test of Nelson and Mayer may help in deciding), Hudson's theory as to the relationship of syphilis to the extravenereal forms, such as bejel, gains considerable support from such random observations from Southern Rhodesia, Chicago, and Budapest.

Extravenereal syphilis is therefore not uncommon in some of the less civilized populations--in some respects, a reverse of the adage that "civilization brings syphilization." It is spread by close contact and possibly also by flies, which flourish under conditions of squalor. In part, syphilis prevention thus depends on provision of proper housing and sanitary amenities, for under prevailing conditions any mass campaign based on penicillin is likely to be only temporarily successful. Indeed, should it be proved that flies are a common method of transference, it might be that under certain circumstances DDT would be more effective than PAM (procaine penicillin with aluminum monostearate)!

Venereal Syphilis. There are 2 concepts of the mass approach: (1) to treat the entire population of a given area by a sterilizing dose of penicillin, aimed at reducing the common infectious pool rather than at cure; and (2) to treat all persons clinically suspicious (including persons with chancroid, lymphogranuloma venereum, and granuloma inguinale because diagnosis is often made by relatively inexperienced personnel). In many of these areas, all patients are not necessarily seen by a doctor; cases of genital discharge tend to be labeled "gonorrhea" and cases of penile or near genital sores, "syphilis." Often dark-field illumination is unavailable and follow-up is impossible for all but a few individuals. While venereal disease problems are only a small fraction of the many problems encountered, the diagnostic situation can be bettered by the proper training of technicians.

The treatment of syphilis has become so simple that it has quite outstripped the simplicity of diagnosis. Therefore, rather than deny millions the benefit of mass treatment pending the years which must elapse before adequate facilities for accurate diagnosis can be established, modern treatment can be given en masse. The single-shot treatment of syphilis employing 2.4 mega units of procaine penicillin with 2 percent aluminum monostearate for primitive peoples with venereal and extravenereal syphilis is most valuable. It is not denied that such treatment is inferior to penicillin treatment. However, the administrative advantages of a single injection in territories which are visited only occasionally by a doctor and in which proper follow-up is impossible are enormous, and precautions against misuse of the penicillin in the absence of the doctor are easier to observe. Of 99 African Negroes with penile sores given single intramuscular injections of 2.4 mega units of PAM, only 11 required sulfa drugs in addition. Single injections of PAM given to Africans with sores should consist of not less than 2.4 mega units, because a lesser amount is insufficient for chancroid. (J. VD Inform., October '50, R. R. Willcox)

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Podophyllin in the Treatment of Cutaneous Carcinoma: Podophyllin (resin of *podophyllum* N.F.), an extract of the dried rhizome and roots of the May apple, or mandrake, has been employed for more than 100 years as a laxative and more recently as a supposed liver stimulant. In 1942 Kaplan reported successful results in the treatment of condyloma acuminatum with topical application of a 25 percent suspension of podophyllin in liquid petrolatum.

Similarity between the cytologic effects produced by podophyllin and those produced by colchicine and the known cancerocidal action of the latter suggested utilization of podophyllin in the treatment of malignant growths. Investigators found that podophyllin produced severe damage to sarcoma 37 in mice; that it exerted a selective action against mouse tumor cells in tissue culture; and that pronounced damage occurred to mouse tumor cells following its parenteral administration. It was found that growth of sarcoma 180 implants in albino mice decreased promptly following injections of podophyllin in sesame oil so that at the end of 2 weeks the average size in them was approximately 1/7 that in control mice. In a similar experiment with mouse mammary adenocarcinoma it was found that the terminal volume of the treated tumors was about 2/3 that of the controls. Histologically, both types of tumor after exposure to podophyllin showed extensive necrosis with nuclear changes consisting of diminution in mitoses, pyknosis, karyorrhexis, and an arrest of mitosis before the metaphase, resembling the colchicine effect.

With the in vitro and in vivo demonstration of podophyllin's destructive action on mouse tumors, the next step was its trial in the therapy of malignant growths in human beings. Sullivan treated 20 cutaneous carcinomas with multiple

local applications of podophyllin and obtained satisfactory results in all but one. His follow-up period varied from 1 to 8 months. He concluded that the results were encouraging but that it was premature to express enthusiasm for the method until the permanency of his cures had been established. (See News Letter, Vol. 14, No. 7, p. 6)

Recently the authors treated 1 case of basal cell epithelioma and 1 case of squamous cell carcinoma with podophyllin. Treatment in both cases was considered a failure in that there was not complete eradication of the tumor, but the cancerocidal action of podophyllin was demonstrated in each. In the first case, a large basal cell epithelioma was destroyed except for one small area. In the second, striking changes were noted grossly and microscopically after the applications of podophyllin; observation of degenerative cytologic changes similar to those reported by Sullivan and King and the trend toward greater differentiation of the tumor cells indicated that the drug did in some way interfere with the normal progression of the carcinoma.

Stimulated by the encouraging results reported in the treatment of experimental and human malignant growths with podophyllin, the authors originally intended to use the drug in treatment of a large series of cutaneous carcinomas. However, their observations in these first 2 cases led them to conclude that although podophyllin does have a destructive action on the cells of cutaneous carcinoma, the extent and degree of such action could not be regulated so as to insure total destruction of all tumor cells. This conclusion was supported by Sullivan's recent report that 15 of the tumors he had treated with podophyllin had recurred. Therefore, plans for continuing the investigation of the use of podophyllin in the treatment of cutaneous carcinoma have been discarded. (Arch. Dermat. & Syph., October '50, A. B. Kern and H. Fanger)

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From the Note Book

1. In a city the size of Chicago, it is reported that 630,000 pints of blood would be required within 48 hours after an atomic bomb attack and 450,000 pints within 6 weeks after the attack. The Committee on Blood and Blood Substitutes of the Emergency Medical Services of the Chicago Civil Defense Organization and other committees have decided to establish a "walking blood bank" in Chicago. (J.A.M.A., 28 October '50, A. C. Ivy)

2. The metabolic fate of thiourea in the thyroid gland is discussed in October 1950 Biological Chemistry, J. Schweman, Jr.

3. Investigators emphasize the importance of continued employment of grouping and typing methods in the epidemiological study of the relation of streptococcal diseases to other respiratory diseases and to rheumatic fever. (NAMRU-4, Proj. No. NM 005 051.04, 1 October '50, R. A. Goshgarian et al.)

4. Doctors S. E. Sulkin and R. M. Pike of Southwestern Medical College, University of Texas, are conducting the first comprehensive survey ever made in this country of the incidence of infection among laboratory and research workers. The survey is being conducted with the assistance of a \$3,200 grant from the National Institutes of Health Public Health Service. (Indust. Hyg. News Letter, November '50)

5. The 10th case believed to be recorded of cerebral symptoms in schistosoma mansoni infection is reported and abstracted in the English July 1950 Tropical Diseases Bulletin.

6. A team of medical scientists at Columbia University College of Physicians and Surgeons have concluded that the rice diet for high blood pressure helps patients and has given good results in more than one-half of one group but in its present form it is not a practical method of continued treatment in most cases. The diet is extremely unpalatable, monotonous, and difficult to maintain long enough to exert its effects. (Science News Letter, 28 October '50)

7. A method of providing accurate color transparencies (3-1/4 x 4-1/4 inches) of pathologic sections is described in October 1950 Archives of Ophthalmology by L. Heitlinger.

8. The Dominican Republic has issued a decree designed to provide strict controls against the admission of foot-and-mouth disease into the country. A list of countries officially reported as infected was established. The terms of the decree bans the importation of cattle, hogs, sheep, goats, horses, mules, and any other ruminant. Also banned are fish or frozen meats, organs, glands, and secretions from animals susceptible to the disease, as well as biological products, untanned hides, skins, wool, hair, hoofs, horns, bones, animal products,

or by-products used principally for feed or fertilizer and vegetable products such as hay, straw, bulbs, tubercles, seeds, living or dead plants. Airplanes and ships from infected countries must be fumigated and the shoes of all disembarking passengers must be disinfected.

9. It is estimated that 2,500 persons annually are stung by scorpions in Arizona; 1,553 were reported in a 10-month period as receiving treatment. There are several species of scorpions in the state, but only 2, Centruroides sculpturatus and C. gertschi are lethal. (Arizona Med., March '50, H. L. Stahke)

10. Dr. Erwin Miller formerly of Leipzig, now of West Berlin, has developed a powerful new microscope, popularly dubbed the "atomscope," appearing to be a field electronic microscope. It should prove to be a valuable tool in basic and applied physics.

11. A summary in table form of skin tests in various infectious and parasitic diseases appears in October 1950 Archives of Dermatology and Syphilology, R. L. Baer and M. Yanowitz.

12. During 1949, to prevent the transmission of mental deficiency, psychosis and other hereditary diseases, 1,500 persons in 21 states were protected from parenthood by tubectomy at state or county expense, an increase of 164 over the preceding year. Of these, 946 were done because of mental deficiency, 477 because of psychosis, and 77 because of other hereditary handicaps. (J.A.M.A., 28 October '50, C. J. Gamble)

13. A symposium on burns was held by the National Research Council, Washington, on 2, 3, and 4 November 1950.

14. Commanders Bernard H. Faubion and Leonard E. Johnson, on duty at Fleet Activities, Yokosuka, were guest essayists at the Tokyo-Kanto Annual Dental Meeting held in Yokohama, Sunday, 22 October. Their subjects were: "Clinical Experiences in Dentistry" and "A Technique for Immediate Anterior Bridges" respectively. (PIO, BuMed)

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Special Course in Sanitary Science for Military Personnel: Applications are invited from Regular Navy MSC officers and Commissioned Warrant Officers, HC, to attend the Special Course in Sanitary Science for Military Personnel at the University of California, Berkeley, California, to be given during the University's spring semester beginning 6 February 1951. The course includes instruction in environmental sanitation, rodent control, and venereal disease control and will be followed by two weeks of practical field application.

Requests for assignment to the course should be forwarded to reach the Bureau of Medicine and Surgery, Attention: Code 345, not later than 12 December 1950. Requests submitted by dispatch must be confirmed by following letter. (Professional Div., BuMed)

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Training in Physical Medicine: Applications for formal training in physical medicine are desired by the Bureau of Medicine and Surgery from Regular Navy medical officers who are completing a normal tour of sea or overseas duty and who are interested in this specialty. The training provided will be for a minimum period of one year at an approved civilian institution.

Requests for training in physical medicine must include the applicant's agreement to remain on active duty for three years, including the period of training. (Professional Div., BuMed)

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List of Recent Reports Issued by Naval Medical Research Activities:

Naval Medical Research Institute, NNMC, Bethesda, Maryland.

The Frequency of Bisexual Infections of Schistosoma mansonii in Snails of the Species Australorbis glabratus (Say), NM 005 048.02.24, 8 June 1950.

The Effect of Adrenalectomy on Radiation Induced Mortality of the Mouse, NM 006 012.04.30 (Formerly NM 007 039), 27 June 1950.

Note: Those interested in seeing copies of the complete reports should address their request to the research activity from which the report originated.

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BUMED CIRCULAR LETTER 50-120

26 October 1950

From: Chief, Bureau of Medicine and Surgery
To: All Ships and Stations having Medical Department representatives

Subj: Reporting of War Casualties on Form NavMed-F

Ref: (a) Art. 23-213(3), NavMed-P-1313, Instructions Governing Individual
Statistical Report of Patient (NavMed-F)
(b) Art. 23-208, NavMed-P-1313

1. Reference (a) provides for the use of a key letter to indicate the nature of violence when reporting cases of injury or poisoning on NavMed-F. It provides that key letter "C" be assigned to casualties incurred during or as a result of action against an organized enemy.

2. Heretofore, a key letter has not been required in reporting any types of disease cases. However, it is desired that battle casualties be identifiable as such on NavMed-F as long as they remain on the sick list, even though the diagnosis be changed from the injury to a disease diagnosis. It is therefore directed that casualties due to enemy action be identified on NavMed-F by key letter "C" as long as they remain continuously on the sick list following the battle injury, regardless of changes in diagnosis. Casualties who, after return to duty, are readmitted for further treatment of the battle injury or its sequelae shall likewise be identified by key letter "C".

3. A number of Navy and Marine casualties have recently been treated in and returned to duty from medical facilities of the other armed forces. In the interest of complete recording of important data, attention of all concerned is directed to reference (b), which contains reporting instructions covering patients treated in hospitals other than naval hospitals. (This letter will not be printed in the Navy Department Bulletin.)

-C. A. Swanson

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BUMED CIRCULAR LETTER 50-121

27 October 1950

From: Chief, Bureau of Medicine and Surgery
To: Distribution List

Subj: Safety Precautions in Surgical Operating Rooms Against Explosive
Anesthetic Cases: Policy Regarding

- Ref: (a) BuMed CirLtr No. 48-45
(b) BuMed CirLtr No. 48-145 modified by CirLtr 49-27
- Encl: (1) Recommended Safe Practice for Hospital Operating Rooms, National Fire Protection Association Pamphlet No. 56, dated 1950
(2) Report of Committee on Explosions in Hospital Operating Suites, dated January 1, 1950

Reference (a) is hereby cancelled. This letter (50-121) contains instructions conforming with the provisions of the nationally recognized code as published in enclosure (1) and to the practices, material and type of equipment approved and accepted by the Committee on Explosions in Hospital Operating Suites as reported in enclosure (2). The purpose of these standards is to direct attention to the ignition hazards of flammable mixtures of combustible anesthetic agents and to the measures applicable to control these hazards. The attention of all activities under the management control of BuMed having major surgical operating rooms or delivery rooms is directed to the provisions of enclosure (1). Medical Department activities or stations under the management control of other Bureaus, employing gaseous anesthetics, must negotiate the necessary procedures with the respective bureau or department having management cognizance and financial control.

This letter will not be printed in the Navy Department Bulletin.

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BUMED CIRCULAR LETTER 50-122

3 November 1950

From: Chief, Bureau of Medicine and Surgery
To: All Medical Activities Providing In-Patient Care
Subj: Disposition of Clinical Records Arising from Joint Hospitalization

Ref: (a) Item 41, Par 12B11.5(c), Manual of the Medical Department
(b) BUMED Circular Letter No. 50-117 of 18 Oct 1950

1. Reference (a), which governs the disposition of patients' jackets or clinical records, was modified by reference (b). To avoid any possible confusion with respect to the procedures prescribed by reference (b), that letter is hereby canceled and the following instructions are substituted.

2. Upon discharge to duty of an Army patient from a Navy hospital, the patient's jacket or clinical record shall be removed from the numerical file of patients' jackets and forwarded to the Army Administrative or Liaison Unit at the hospital for appropriate disposition in accordance with Army directives.

At medical activities where such an Army Unit does not exist, the record shall be forwarded to the Adjutant General, Washington 25, D. C., Att: Personnel Information Branch.

3. Upon discharge to duty of an Air Force patient from a Navy medical activity, the patient's jacket or clinical record shall be forwarded to the Chief, Demobilized Personnel Records Branch, Building 105, Records Administration Center, AGO, St. Louis 20, Missouri.

4. When an Army or Air Force patient is transferred from a Navy medical activity to an Army or Air Force installation for further treatment or disposition, the patient's jacket or clinical record shall be sent to the receiving Army or Air Force installation. This type of transfer will ordinarily be made through the Army or Air Force Administrative or Liaison Unit where such a unit has been established.

5. In the above instances out-cards shall be inserted in the Navy activity's patients' jacket file in place of the removed jackets. The cards shall indicate the name, case number, diagnosis, date of discharge, and the place to which the record has been sent.

6. By agreement with the Army and Air Force, a reciprocal arrangement will be followed with respect to Navy patients hospitalized at the medical activities of those Services. When a Navy patient is discharged to duty from an Army or Air Force Medical activity, the patient's jacket or clinical record will be transferred to the Navy Administrative or Liaison Unit. If such a unit has not been established the record shall be transferred to the Navy Records Management Center, Garden City, Long Island, New York.

7. If a Navy patient at an Army or Air Force activity is transferred to another Navy medical activity for further treatment or disposition, the patient's jacket or clinical record will be sent to the receiving Navy activity.

8. X-ray films created as a result of joint hospitalization shall be disposed of in the same manner as the clinical records. Existing Navy regulations governing the disposition of the Navy's records on its own personnel are not hereby changed. (This letter will not be printed in the Navy Department Bulletin.)

-C. A. Swanson

NAVY DEPARTMENT
BUREAU OF MEDICINE AND SURGERY
WASHINGTON 25, D. C.

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